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**SPECIAL SESSION ON INFORMATION INFRASTRUCTURES  
'TOWARDS REALISATION OF THE INFORMATION SOCIETY'  
3-4 APRIL 1995, OECD, PARIS**

**ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT**

**Paris 1996**

**29377**

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## **FOREWORD**

The main purpose of the Special Session on Information Infrastructures ("Towards Realisation of the Information Society") of the Committee for Information, Computer and Communications Policy (ICCP) held 3-4 April 1995 was to identify the main issues confronting governments and business in this regard, by examining the economic and social impacts of information infrastructures, the development of new applications and the markets for them, the requirements for regulatory frameworks for national and the global information infrastructures and the principles governing the transition to global information infrastructures and the development of global information society. Following the G-7 Ministerial conference on the Information society of February 1995, there has been a movement towards consensus among OECD countries on these main principles. The Special Session started the process of building on these principles and movement towards their further elaboration and eventual implementation. This document regroups the rapporteur's report of the Special Session prepared by Professor Jens Arnbak and Mrs Jolien Ubacht (Delft University of Technology, The Netherlands), the Chairman's closing statement, two Secretariat papers prepared for the occasion by Dimitri Ypsilanti, Yvonne Walhof and Jeremy Beale, and the Programme.

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## **PART I**

### **CHAIRMAN'S CLOSING STATEMENT**

## **CHAIRMAN'S CLOSING STATEMENT**

Work on information infrastructures has already become a high priority of the Committee for Information, Computer and Communications Policy. The mandate for this was given by OECD Ministers in 1994 following their confirmation of a request by the G-7 to the OECD to examine, among other issues, information infrastructures in the context of the Organisation's work on technology, productivity and employment. Broadening the dialogue on information infrastructures issues to include non-OECD countries has also been stressed as important by many Member countries. In this context a joint **Asian Pacific Economic Cooperation (APEC)/Organisation for Economic Cooperation and Development-Pacific Economic Council (PEEC)** Symposium on "Building the Foundation For the 21st Century" was held in Vancouver in February 1995. The G-7 meeting in February 1995 on the Information Society gave further political impetus to this issue and the role that the OECD can play.

This Special Session of the ICCP Committee on Information Infrastructures has clearly shown that OECD countries are rapidly facing up to the economic and social challenges and opportunities raised by information infrastructures and multimedia. The Special Session has also reconfirmed the intention of countries to work together, to share experiences, to solve common issues and strive to achieve open and compatible frameworks.

The purpose of this Special Session of the ICCP Committee has been to identify the main issues confronting government and business leaders in the development of information infrastructures in the OECD area by examining the economic and social impact of information infrastructures, the structural and policy requirements in developing applications, changes and solutions needed for regulatory frameworks and international principles needed to develop global infrastructures and applications. There has been a significant coalescing among OECD countries of main principles underlying the development of infrastructures and multimedia applications. It is necessary now to build on these principles and move them towards the next stage of elaboration and eventual implementation.

### **Basic Challenges**

It is clear that the challenges which government and business leaders face in response to the development of information infrastructures are immense. The convergence of communications, computing and information/entertainment sectors is fundamentally transforming existing social and economic structures, while at the same time opening significant opportunities for human creativity and wealth creation. In particular, it is not easy to forecast what will be the effects on employment practices, job creation and social activities as a result of the widespread introduction of information infrastructures and the multiple types of voice, data and video services which can be developed from them. While making the existing activities of industry and government more efficient, we have also to identify ways to ensure that new economic activities can develop which provide new, well paid and interesting work for people, and that the public provision of services meets people's needs better and makes governments more effective.

Governments need to understand better the economic and social impacts of information infrastructures and related applications, and develop appropriate policy responses where necessary. In this context, governments need to develop new statistical tools and methodologies for analysing,

recording and responding to the changes associated with information infrastructures. Present systems are not adequately suited to the fast-moving and fundamental changes arising out of the new environments of multimedia services and information infrastructures.

There is general acceptance by OECD governments that the full economic benefit promised by an information society will only come about through rapid development and diffusion of new applications. Both governments and the private sector have a role to play in promoting new applications, ensuring national and international interoperability and efficient pricing structures. Governments have an important catalytical role to play in the adoption of new applications especially in the area of public services such as education and health service administration and provision. In addition, national restrictions on the content of different media are becoming both increasingly less effective and counter-productive to the development of new services.

There is also widespread understanding and support by OECD governments and the private sector that without appropriate regulatory frameworks the development and diffusion of applications will lag. The development of integrated voice, data and video services requires liberalisation of existing regulatory regimes. The main barriers which presently exist include the different regulatory regimes of telecommunications and broadcast services, and the prohibitions on the cross-participation and provision of a range of different services by market participants. New frameworks need to be based on open market access. In addition, such frameworks need to be based on appropriate regulatory safeguards including fair and efficient interconnection and equal access principles for infrastructure and service providers of different types and sizes.

Governments and social partners have stressed the importance in maintaining and examining the possibilities of extending universal service provisions in due course, to ensure that all members of society can participate in the information society at reasonable costs to them. The importance of privacy protection has increased with the new emphasis on networking and integrated information flows. In addition, concepts of network security and intellectual property need to be continuously assessed given the proliferation of new services and forms of delivery. Only then will individuals and businesses have the confidence to invest in them and use them to their full potential.

Participants at the Special Session stressed in particular the importance of the global information infrastructure, the economic benefits that this would bring and the need, therefore, to ensure that road-blocks to its implementation were removed. The importance of moving forward and building on global principles, which would facilitate and interlink national initiatives, was viewed as a key area and one where the OECD need to place further emphasis. The OECD countries need to place particular emphasis in the context of global information infrastructures on problems faced by developing economies in building-up their infrastructures. Rapid progress in this area was essential. As well the importance of the ongoing work in the context of negotiations on basic telecommunication services at the World Trade Organisation was stressed.

### **Future Goals and Orientation**

It is uncertain what the demand will be for different applications of networked multimedia services, and the risk and rewards for finding the right services for which there will be large scale demand lies with the private sector. Governments need to provide a framework which will uphold sustained investment in infrastructure, which encourages technological diversity and consumer choice, without exclusively supporting specific applications which might distort competition and

suppress true demand. Pilot projects can play an important role and, in this context special emphasis needs to be given to the 11 pilot projects agreed to by the G-7 at their Brussels Ministerial conference.

During the Special Session there was a general consensus that, even though the private sector, and private investment, will have a key role in the development of information infrastructures and of applications, governments need to act rapidly to ensure that their policy frameworks facilitate private initiatives. As well, policies need to reflect the emerging consensus on international principles. In the present economic situation faced by OECD countries this role of governments takes on particular importance because of the longer term economic and social potential of the information society.

The ICCP Committee will have an important responsibility in identifying and defining future issues in evolving regulatory frameworks, helping to formulate the required policies and describing and analysing obstacles and opportunities for the beneficial development of information infrastructures and multimedia services.

## **PART II**

### **RAPPORTEUR'S REPORT**

**Written by Prof. Jens Arnbak,  
assisted by Mrs. Jolien Ubacht,  
School of Systems Engineering, Policy Analysis and Management  
Delft University of Technology, The Netherlands**

## **RAPPORTEUR'S REPORT**

### **I. Introduction**

A message voiced by the ICCP with increasing conviction during its first ten years of existence is the need for structural and policy changes and more suitable regulatory frameworks, in order to increase the economic and social benefits of new information and communication technologies (ICT). The early recognition by the ICCP of the future significance of the germinating convergence of the telecommunications, computing and broadcasting sectors has positioned it well for a closer examination of optimum conditions for the transition to a more knowledge-based international economy.

With the mounting political interest in the novel concept of Information Infrastructures (II) since 1993, a new impetus has been given to the examination of appropriate policy actions and their socio-economic consequences. A mandate was given by OECD Ministers in 1994 to consider this concept in the wider perspective of the Organisation's ongoing work on technology, productivity and employment. In keeping with the multilateral traditions of the OECD, many member states emphasised the need to consider the related issues in a global context, including non-OECD countries.

A Special Session of the ICCP was convened for this purpose at the OECD in Paris, 3-4 April 1995. It thus took place in the wake of the G-7 Ministerial Conference dedicated to the Information Society and having reached agreement on 11 international pilot projects in the area of networked multimedia services. Frequent references to this Ministerial Conference in Brussels, to the joint APEC/PECC/OECD Symposium in Vancouver on "Building the Foundation for the 21st Century" (both held in February 1995), and to the several other international meetings held on this subject in the last year, were made at the Special Session of the ICCP. The ICCP Chairman, in his Welcome Address, summarised the emerging general principles for development of global information services and the underlying infrastructures as follows:

- competition
- co-operation
- diversity
- openness
- safeguards.

These five broad principles are also recurrent in the national policy plans and action programmes recently adopted or proposed for the II in many OECD countries. Clear differences in national emphasis exist, but governments nevertheless one and all declare positive views on the general possibilities and promises of ICT.

The following account of the results of the Special Session summarises the main questions and the evolution of tentative answers. This approach will allow readers not having attended the Special Session to identify the important common points at issue in the ICCP work on II. Such an agenda-setting approach is more fruitful at the initial stage of this programme, which is planned to be finalised in due time for reporting to the 1996 OECD Ministerial meeting. As a consequence of this

synthetic approach chosen by the rapporteur, he accepts the sole responsibility for all omissions or factual errors in this account.

## **II. Source material**

Many countries made their national Information Infrastructure plans or policy papers available to participants in the Special Session. Differences in emphasis are evident and can be understood from the domestic economic and social situation and, notably, the perceived national strengths. The cultural traditions and institutional arrangements in each individual country, not least in the area of broadcasting and other audio-visual services, also play a role. A very useful overview and comparison of the various national initiatives and policies for Information Infrastructures in 11 OECD countries is found in a background document for the meeting (Part IV of this paper). This review also includes the corresponding policy positions of the European Union and the G-7. It is divided into four specific parts, matching the agenda set for the Special Session. (See Part V). In addition to this structured background material on national policy, the Secretariat provided a policy issues paper posing a range of questions for possible discussion at the Special Session (Part III).

## **III. The notions of (Information) Infrastructure**

At the present early stage of international deliberations, the Special Session showed that a clear common notion -- let alone definition -- of the II has yet to emerge in OECD countries: Some countries put more emphasis on the capacity of networks, while others see new services and applications as the key area of interest. Very substantial parts of the world must still give absolute priority to the evolution and penetration of public telephony. Some countries now possess a ubiquitous narrowband infrastructure for telephony and data communications, plus various analogue broadband networks for one-way delivery of audio-visual programmes; these highly developed countries look for wider and more integrated service perspectives as their penetration of personal computers rapidly approaches 50 per cent of all homes.

The term 'infrastructure' until recently referred to fixed collective installations and logistic facilities necessary to support and supply operations of a country, or even an alliance of countries. However, the meaning of this word has widened in recent years to designate the supporting systems of any specific organisation -- be it public or private, large or small. This modern trend results in less emphasis on the shared and universal use associated with the classical notion of public infrastructure. For example, computer firms now advertise their local area networks as the proper 'infrastructure' to satisfy the specific business interests of a particular organisation. But many national telecommunications acts still apply the very same word for the integral body of fixed transmission and switching facilities underlying the universal public supply of communications services in a certain geographical area. Still, there is also considerable variation between the legal definitions of the extent of public telecommunications infrastructure in different OECD countries. The different positions and regulation of specialised domestic networks for delivery of audio-visual services, such as broadcast transmitters and cable television networks, illustrated this point most clearly -- a matter of potential importance for delivery of multimedia services in the future Information Society.

Appropriate regulations for the dynamic ICT markets may thus seem to require more precise, but at the same time flexible notions of (public) information infrastructure. This view was stated in several presentations and interventions at the Special Session. The need for a clearer description is most strongly felt in two areas: (i) where new demarcation lines are to be traced

between retreating monopolistic supply and more competitive market arrangements, and (ii) when safeguards for fair and equitable interconnection arrangements between an incumbent operator and new market entrants are to be laid down. In addition, many countries are reviewing the extent of the Universal Service Obligations to be imposed on the operator(s) of the national II.

Given the strong emphasis put on market initiatives for developing a national II by many OECD countries, and the common desire for international principles, it appears necessary to give priority to a clear and consistent description of the activities which fall within the scope of the II. Hence, common principles or reference models for the II were seen as a priority by many participants.

Of the most embracing descriptions of Information Infrastructure is that found in the United States, whose policy vision of the II comprises four areas, which extend far beyond the classical concept of infrastructure, i.e., as confined to the underlying physical foundation for specific operations. The four areas are described as follows in "The National Information Infrastructure, Agenda for Action" (1993):

'(1) thousands of interconnected, interoperable telecommunications networks; (2) computer systems, televisions, fax machines, telephones and other information appliances; (3) software, information services and databases (e.g. "digital libraries") and (4) trained people who can build, maintain and operate these systems'.

The US infrastructural concept thus includes the network terminals and other private appliances in homes and offices. It also covers information content -- so far clearly separated from the infrastructural conduit in US regulatory tradition -- and even human intelligence. It was related to a "beehive"-- model of the future Information Society.

Clearly, such an organismic metaphor contrasts strongly with the classical engineering perception of public infrastructure, which puts the emphasis on *predictability, procedures, and efficiency of delivery* -- in short, on a more mechanistic model of infrastructure. This view has matured in the administrative environment of the public service and hence has often been based on *a priori* principles of codified law and conformance with technical standardisation, particularly in continental Europe. An organismic view of infrastructure, on the other hand, puts more emphasis on *adaptability, processes and effectiveness of delivery*, and so may thrive better in the learning process on competitive markets.

It is tempting to over-emphasise such differences in order to appreciate fully the tremendous task confronting the ICCP Committee in developing a consistent view on the development of information infrastructures, especially in a global context.

#### **IV. The Economic and Social Context of Information Infrastructures**

A matter of considerable socio-economic concern in most OECD countries is the rapid loss of employment in manufacturing industry, both in absolute terms of number of jobs and measured as a percentage of total gainful employment. Many observers see this as evidence of the predicted post-industrial trend towards a service -- and knowledge-based economy in the Information Society. Several speakers and discussants at the Special Session addressed the question of how to create a sufficient number of new jobs to compensate for the losses occurring in the manufacturing industry, and for the jobs eliminated where monopolistic supply of telecommunications infrastructure is exposed to market forces. Further OECD research in this area was urgently requested by the representative of the Trade Union Advisory Committee of the OECD, who like other speakers

referred to the recent loss of jobs in the European telecommunications industry due to increased competition and relocation of jobs between national economies. It was generally acknowledged that traditional statistical methods do not offer the data needed to analyse fundamentally new structural trends, such as the changes of the nature of jobs, the structure of work, and the re-location of particular jobs within and between national economies.

Rapid structural changes appear to be taking place in national economies built on the traditional foundations of the manufacturing Industrial Society. With the globalisation of trade, newly industrialised countries (NICs) and some Eastern European countries can now bring their lower cost structure to bear in international competition. This, in turn, leads to higher economic growth and consumption in these countries. Therefore, the loss of employment in the manufacturing sector of OECD countries does not merely reflect the increased industrial competition from outside, but also the emergence of markets able to attract production facilities and other investments from OECD countries. In the area of ICT, all these new trends add up to a rapid exodus of the production of electronic consumer goods from OECD countries, which may retain only corporate headquarters and special facilities, including R&D-centres, and the regional distribution and service centres for their domestic market. This, in turn, explains the shift in strategic focus away from hardware production towards service creation and software production in many OECD countries.

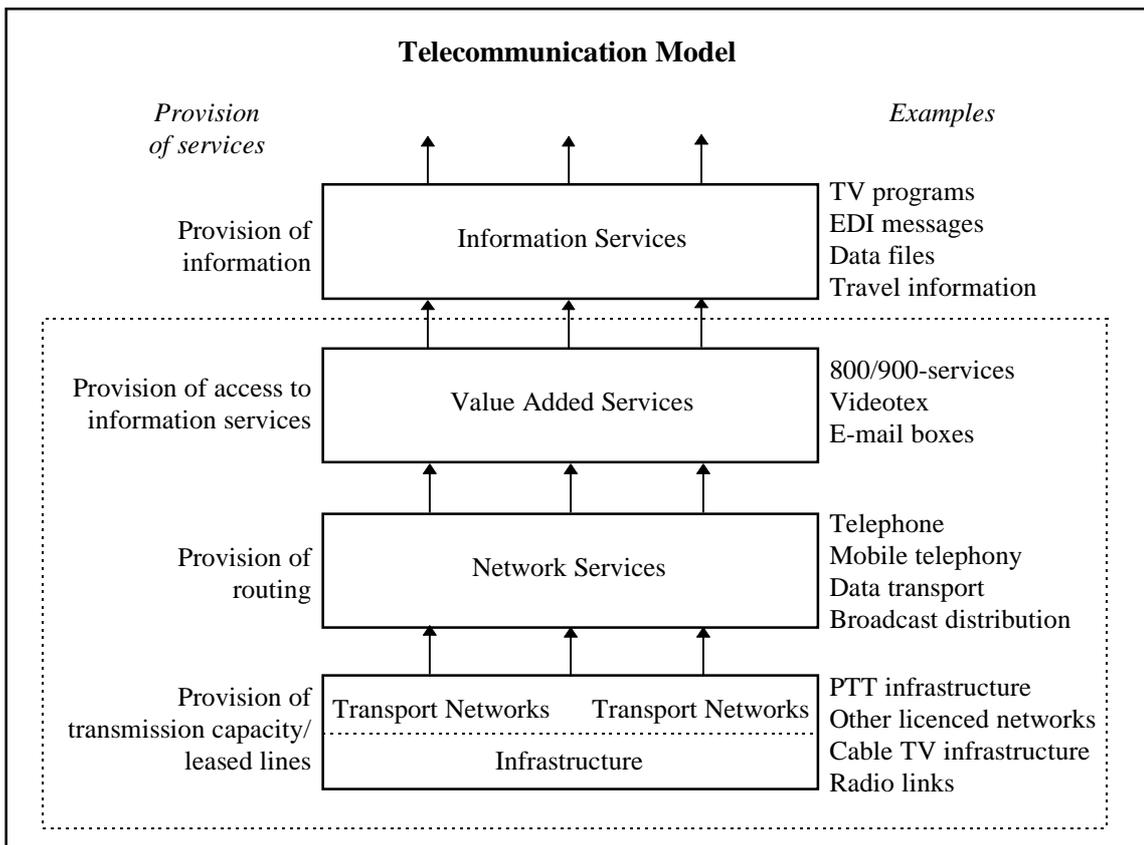
Loss of jobs can also occur in (physical) infrastructural activities. A number of source documents and speakers refer to the -- often substantial -- lay-off of personnel by telecommunication operators who must become more efficient in the face of competition, or who have completed a major installation or refurbishment programme. In particular, many jobs have been eliminated in the areas of cable laying, maintenance of (electromechanical) switches, and the many auxiliary activities no longer seen as core business by most operators (e.g., canteen facilities, transportation, hardware-oriented R&D). Often, such activities have been outsourced, so the net loss of jobs may be less. In addition, many jobs have arisen from new operator activities, such as wireless (cellular) networking, service creation, quality assurance, customised billing, etc. It is generally noted that standard labour statistics do not adequately capture these quantitative and qualitative shifts in employment. This problem adds a very speculative element to the present balance of creation and elimination of jobs in the ICT sector, but cannot be solved in isolation within this sector.

In any event, the major structural changes in the ICT market give rise to a strong demand for new skills and, hence, for a new approach to vocational education at all levels. The Special Session was reminded that economic growth in the past has been more accelerated in an environment of general literacy and a creative plurality of views than by strongly focused technological innovation and strict media rules, particularly in times of structural change. There was, however, little reference at the Special Session to general content aspects of the II. This may be considered surprising in view of the widely held opinion that provision of information content and access to information services will be the most promising markets.

## **V. Network Structures and Market Strategies**

The present, rather vague notions of Information Infrastructures referred to in Sect. III were reinforced by the much clearer views on evolving markets and (corresponding) network structures advocated in several presentations. Several speakers and discussants referred to 'layered' structures of service provision, either as a basis for analysis of market segmentation or in order to develop regulatory frameworks. We consider the regulatory aspects further in Section VI.

Figure 1 shows one such reference model of communication and information service infrastructures, with four layers of service provision. In analogy with the Open Systems Interconnection (OSI) model and the various proprietary models adopted by computer manufacturers, the higher layers require services from the lower layers. The bottom layer comprises the provision of the transport infrastructure of transmission links; these require 'rights-of-way', radio-frequency assignments, or other special rights based on licensing by public authorities. At the next layer, one or more network operators provide the routing capacity to connect users to each other during a communication session, by appropriate switching of transmission links in the bottom layer. Routing may also connect users to the providers of value-added services, located at the third layer from below. These value-added service providers enhance the value of the 'bare' network service by offering access to free-phone (800) services, electronic-mail boxes, Internet, videotex, etc.



**Figure 1.** The layered model for telecommunications and tele-information service provision

The *kiosque* of the French Minitel system is a classical example of a separate third-layer provision of access, which includes the ability to charge for information (video programmes, database files, banking and travel services, and so on) delivered by separate content providers. These belong at the topmost level of the layered model.

While the available services and precise regulatory borders in such a layered model vary from country to country, it was pointed out that certain economies apply at each layer. Thus, the lower layers are burdened with considerable economies of *scale*, because of the high costs of physical infrastructure. Unfortunately, this will remain true in the event of fibre ‘highways’ to the home. Hence, only a few large operators are sustainable in this ‘transport industry’, either because of formal monopolistic restrictions justified by universal-service obligations, national security, etc., or simply because of the economic reasons, which may hinder new local entrants. On the other hand, the ‘content industry’ also enjoys economies of *scope*: Its revenues can be raised either by globalisation in one particular service niche or by a suitable synergy, such as bundled provision of different national services. Thus, a plurality of specialised business strategies and providers may be feasible at the highest layer. Although this is an area subject to traditional government interventionist policies for public media, including broadcasting, it was argued that the market developments at this layer are ‘uncontrollable’ or, at least, unpredictable.

Often, the role of R&D is to change the network economies and service costs incurred at the different layers. Pre-competitive R&D-programmes may not merely have a technical impact on network architectures, consumer products and open standards; the most successful programmes can also result in major changes in the operators’ economies of scale and scope and, hence, in the market structure. For instance, new wireless technologies improve the economy of the sparingly used, but costly, local loop to individual subscribers and, hence, could affect the classical paradigm of (local) telephone monopolies still adhered to in most OECD countries. Europe’s pre-competitive GSM research programme eventually resulted in the introduction of competition between mobile operators. Such wireless innovations may call for economic principles for more efficient assignment of scarce radio frequencies than the administrative procedures in force in many countries.

Several speakers and discussants reiterated that there is a gap between the present cost of modern equipment borne by operators, and their pricing of the corresponding services. This gap can be very wide in the absence of effective competition. The erratic pricing of broadband leased lines, which may vary by an order of magnitude between operators in OECD countries, was particularly criticised as a serious obstacle to development of global information infrastructures for advanced multimedia applications. Arguably, this could also result in national handicaps, both for modern government services and for new business applications, and would need to be addressed clearly in plans and policies for realisation of the Information Society: Market-driven applications will evade those countries where service providers or users have to foot operator bills considered non-competitive or even unreasonable. Access to alternative broadband infrastructure, including specialised networks of railway and utility companies and cable-television networks, is foreseen in the national II plans of several OECD countries. Ongoing R&D programmes on wireless multimedia service provision might also open new channels to users.

It was observed that a layered structure, similar to that displayed in Figure 1, also exists in the computer sector. At the lowest layer, hardware platforms and terminals connected to the network will dominate; at the higher layers, software-related products and services are found. The convergence of computing and communications (‘telematics’) will result in a ‘Siamese-Twin’ relation between these two layered structures, it was argued. Still, the situations in the two sectors are not

completely parallel: The significant economies of scales in production and delivery of hardware in the *computer and terminal sector* are hardly reflected in national monopolistic regulation, but rather in the rapid market shake-outs and concentration of manufacturing in the NICs. Conversely, geographical relocation of infrastructural activities at the lowest layer of national *network operations* appears virtually impossible, for physical and economical -- if not legal -- reasons. On the other hand, many OECD countries now appear to focus more on higher-layer software/content activities which could, in principle, quite easily be relocated to the NIEs or other countries, given appropriate local programming and marketing skills and access to modern international networks. It would appear crucially important for OECD countries to maintain the leading edge in such skills and in advanced network availability, since content/software activities could, in principle, become nomadic once a Global Information Infrastructure is in place.

In conclusion of such strategic considerations, one speaker outlined four likely market options for operators and service providers, namely to:

- a) enhance or expand present domestic network(s)
- b) add new services and features to existing networks
- c) expand into traditional networks/services elsewhere (as a mega-operator or niche player)
- d) move into value-added services or content provision.

These strategies correspond to different movements towards vertical or horizontal integration in the layered structure in Figure 1. It will be a matter of competition policy and other regulatory principles to determine when these options should be encouraged or prevented, and how the increasing number of competitive players must co-operate to maintain interconnectivity and universal service in the new circumstances.

## **VI. Towards Common Regulatory Frameworks**

The Special Session was warned that establishing regulatory barriers between converging economic sectors, such as broadcasting and telecommunications, will be in vain. This might pose problems for countries with traditional segregated regulation, but to limit political interference governments may also need to decide between regulation by government or by a separate governmental authority. In some countries, the responsibility for policy for the Information Society falls to many different government Ministries, in view of public domains such as culture, communications, education, etc.

Some EU Member states also advocate an intermediate phase prior to full liberalisation in 1998, during which alternative infrastructures would become available to third parties.

Speakers from several countries agreed that content and carriage issues become increasingly intertwined, partly because of the market tendency towards vertically integrated Information Infrastructures covering most or all the service layers in Figure 1. Broadband infrastructures other than broadcast networks are still largely non-existent, it was pointed out. But speakers from other countries appeared unconvinced about the institutional feasibility of joint regulation of content and carriage. As stated by one speaker, many aspects of business, social and cultural life contain user patterns which are "invisible to government". Government should rather act as a model user itself. Countries also stressed the need for multilateral international agreement on flexible principles for

open global infrastructures more strongly than any problems with convergence of national broadcasting and telecommunications. Countries are also considering institutional arrangements for regulation at a distance from government to reduce political interference.

Much business frustration is indeed caused by the fact that liberalisation or divestiture of communication infrastructure and services often results in complex transition rules, additional regulation and an increasing number of legal disputes with competitors or the State. However, the discretionary powers of an independent regulator were also seen as objectionable by some business users and operators. The fundamental question here seems to be whether 'liberalisation' can be a synonym for 'deregulation' in the area of II.

Another set of commercial problems related to the development of the II is experienced with the Internet. As pointed out by a number of speakers and discussants, this successful international network of networks does not yet comply with elementary, but essential requirements for security, privacy and recognition of intellectual property rights. This could frustrate the creation of networked information markets, where suppliers and users of information will be confident to 'meet' and trade electronically with each other. The need for international harmonisation in this area has to be addressed.

A third area requiring consideration is the need for international standards for the II, to allow easy interconnection of networks and interoperability of services across borders. This is a field where considerable differences seem to exist between the policy views held in OECD Member states: In the EU and Japan, more formal policies for standardisation are in place than in the US. However, this is not strange in view of the much larger home market in North America where, moreover, the existence of the Bell system ensured the informal adherence to unified network interfaces and protocols until divestiture of AT&T in 1983. In practice, this history has given the US a leading edge in the development of procedures for interconnection and equal access in a competitive, but technically harmonised environment. The more monopolistic, but technically fragmented PTO networks and the smaller home markets in the smaller OECD countries give them a stronger incentive to standardise new systems such as GSM and the future II.

In conclusion, the Special Session thus demonstrated a clear and urgent need for discussion of main principles and reference models for the II. In the multilateral OECD context, such principles and models should apply to global infrastructures and service provision, in order to provide common guidance for interconnection rules and transparent regulations of national markets. Governments will need to act rapidly to ensure that their national policies facilitate private initiatives and the pilot projects agreed at international level. Building the reference models on harmonised principles will improve economies of scale and scope, both for new initiatives and for basic telecommunication service. This will reduce the inevitable uncertainties of demand, supply and investments in novel markets, and so allow a wider reach of services in the future Information Society. According to the Chairman of the Working Party on Telecommunications and Information Services Policy (TISP), the agenda of the ICCP and its working parties should be determined by the need to attract investors in the II. Quality of services will be a key concept to create the confidence to invest in new markets.

In closing the Special Session, the ICCP Chairman reminded participants that government policies need to reflect the emerging consensus on international principles. In the present economic situation faced by OECD countries, this is of particular importance in view of the longer term economic and social potential of the Information Society.

**PART III**

**POLICY ISSUES**

## **POLICY ISSUES**

The ICCP's Special Session on Information Infrastructures will examine the economic impacts and policy issues raised by the development of information infrastructures (II) and international, or global information infrastructures (GII). This paper aims to provide an overview of the issues and to help stimulate and focus discussions at the meeting. In particular, the paper outlines in brief an introductory analysis of the following issues:

- the economic and social impacts and benefits which the development of new applications and information infrastructures can provide, and the issues which governments need to confront and overcome in order to realise these benefits;
- the driving forces behind and barriers to the development of information infrastructures for large-scale demand and supply of new network applications integrating voice, data and video services;
- the regulatory and policy measures which governments need to take to optimise the benefits of national information infrastructures;
- the implications of these issues for international information infrastructure development, and the specific impact of information infrastructures on international relations.

Inevitably, there is overlap between these issues, but it is hoped that each session will fully develop a particular perspective on the issues which will interlock with and build on discussions in preceding sessions.

### **Session 1: The Economic and Social Impacts of Information Infrastructures**

The recent interest in information infrastructures has been based on their perceived potential to increase productivity, stimulate economic growth and create employment in new activities. This is a pressing matter at a time of high unemployment in many countries and increasing international competition. For growth to occur in advanced, value-added areas, the costs of communication and information inputs which are their lifeblood need to come down. Otherwise, general economic anaemia will set in.

As ubiquitous infrastructures for a range of other activities, communications infrastructures are far-reaching in their ability to affect the workings of society. Nevertheless, their impact in different areas is varied, and there is legitimate concern that the increases in productivity in existing sectors which new information infrastructures can help achieve will fail to be offset by demand for and growth in new service areas. Additionally, there are fears that the qualitative impact on employment practices and social activities will be negative. In addition, negative impacts are likely to accumulate in the short term as a result of transition costs and learning effects, compared to the longer term when the net positive economic and social gains can be expected to be more evident. Analysis therefore needs to be brought to bear on how the broad social and economic impacts of developing information infrastructures are unfolding.

Supply and demand relations between firms are changing fast through the implementation of information services and multimedia products, particularly when combined with the introduction

of information infrastructures. In particular, the development of just-in-time forms of delivery, automated inventory and stock control, and customer billing arrangements have undermined the arms-length structure of traditional market relations and facilitated vertical interlinkages between firms in different sectors. While firms have been able to gain a much greater awareness of and responsiveness to different customer tastes and consumption patterns as a result, labour relations are being restructured in the production and delivery of goods and services (re-engineering and downsizing).

The impact of information infrastructures on employment is not simply direct and quantitative, but also indirect and qualitative. For many OECD countries, the creation of new services, or the enhanced packaging and delivery of existing ones, is potentially the most rewarding result of developing information infrastructures. Other information and entertainment sectors can gain from the possibilities offered by new applications to improve their flexibility of demand and supply, improve utilisation of labour and natural materials, and lower costs and more efficiently utilise support services. This potential provides the possibility of new jobs being created to offset those lost by improved productivity being brought about in other sectors. However, such an outcome requires the development of mass markets for service applications, and this depends upon overall macroeconomic relations of demand and supply being sustained.

In this context, it is appropriate to evaluate the immediate role that governments can play in supporting the accelerated development of information infrastructures. Retraining of the workforce is particularly important in an economy where skills are being made redundant at a more rapid pace. The closer relationship between customers and their suppliers within a broad competitive market framework also changes the nature of commercial relationships. In addition, the vertical interlinkages of previously unrelated sectors means that the appropriate placement and effects of incentives for R&D, employment and information generation and distribution anywhere along the chain of supply is fundamentally more difficult to ascertain. A key issue which needs to be addressed in order to define effective policy responses is, therefore, **how** to measure these different impacts of information infrastructures and multimedia services. Existing statistical categories and data collection procedures are often inadequate for monitoring and keeping pace with the changes involved.

In the longer term, the impact on society of information infrastructures and applications is expected to include fundamental changes in working habits and work location, access to information, leisure and social interaction. Whether these impacts will be socially disruptive or beneficial will depend on the rate and manner of implementation of new applications and network diffusion and on adjustments in human behaviour. Even though these matters are long term, governments need to consider the social, educational and welfare policies which can support a smooth transition path.

A related issue is the public provision of services such as education and healthcare, and the way in which these need to be re-defined to take into account the development of information infrastructures. These services have traditionally been provided on a universal basis in most OECD countries. As information infrastructures are adopted for delivery and operational purposes (e.g. tele-medicine and distance learning), it is important to consider the extent to which public subsidies are needed for their support, and the relative roles of the public and private sectors in organising the inputs and outputs of these services. At the same time, because these questions raise issues of network utilisation and efficiencies, they touch upon universal service issues traditionally associated with cross-subsidies in telecommunications.

Questions which need to be addressed include:

- What measures do governments need to adopt in terms of (re)training programmes, establishment of seed-finance for SMEs, and information dissemination in order to boost the beneficial impact of information infrastructures on society and the economy?
- Where will labour shedding occur and where and how will employment increase and change? How should government efforts differ for different sectors of the economy?
- What measures may government take in terms of restructuring the relationship between public provision of such services as education and healthcare, on the one hand, and private sector-led information infrastructure development, on the other, in order to maintain social standards of living?
- What measures should governments take to better monitor and measure developments and the impacts of information infrastructures and related applications?

## **Session 2: Market Development and New Applications**

Market and technological forces are currently driving private sector investments in the development of network services which integrate voice, data and video technologies. A wide range of factors will determine the success of these services and the importance of each of them will depend on the type of network application involved. Some of these factors include pricing structures, standards, and the legal and regulatory frameworks for the development and use of applications. The success of many, though, will also depend on their rate of diffusion and the achievement of sufficient market scale. In particular, services aimed at residential consumers rather than business markets will require mass markets in order to achieve price levels which are attractive.

The development of services is contingent on the creation of a market place which allows new applications to be created and expanded. Information infrastructures nowadays provide **the** market place for new services; and the breadth of economic exchange and growth in this market place depends upon how wide a range of technologies and players are allowed to create these infrastructures. New multimedia applications require at a minimum that existing market entry restrictions in the broadcasting and telecommunication service sectors be eliminated and a competitive market be created which allows all potential market participants to supply services. Only in this way will the broad demand for and diffusion of new applications be encouraged, and the necessary economic incentives be provided for investing in advanced network infrastructures.

Integrating existing data, voice and video networks, as well as allowing new market entrants, could optimise development of -- and would maximise the economic return on -- a range of application investments. However, in order to ensure competitive markets develop with appropriate legal safeguards in place, policy makers need to alleviate the tendency of investors to use proprietary systems of access and operation, and prevent the bundling of access and operating systems with service applications. This can otherwise tend to occur because of the high investment costs with broadband networks and the costs associated with developing new network-based applications.

The role of governments in many economic sectors is increasingly confined to identifying and strengthening framework conditions for private sector activities rather than any direct involvement in the development of products and services. Most OECD countries thus agree that the private sector should lead the way in financing the development and diffusion of information infrastructure applications. Some governments, however, also suggest that they have a role in

defining a broad investment perspective along with the private sector for applications which create as yet unknown frontiers of social change and development. This role can be fulfilled through stimulating and building consensus over the use of and demand for information and communications applications.

However, the uncertainty of demand for new applications would tend to imply that governments should avoid trying to influence or stimulate particular private sector application areas. The question of extending universal service coverage is pertinent in this regard since this would, if the concept is expanded to cover certain service applications, help market development in those exclusive areas. Care should be taken therefore not to expand the existing concept of universal service at the present embryonic stage of infrastructure and service development.

Governments can play a similarly indirect role in a number of pre-competitive R&D areas where initially high costs may deter long term private investment. But again, this role can be achieved without subsidising or trying to determine the commercial success of particular applications. Government grants for pilot projects should, therefore, be based on general criteria rather than favouring specific private sector application areas or individual firms.

The level of prices and pricing structures plays the most fundamental role in the successful development and diffusion of applications. By reducing the costs and uncertainty for the private sector in developing open systems and integrating existing networks, and by ensuring open standards in applications technologies, governments can help the realisation of economies of scale and thus help lower unit costs to be achieved. By pursuing these goals within a competitive framework, they can ensure that downward pressures are kept on pricing structures.

In any case, existing experience indicates that applications which are presently viewed as promising may have a long gestation period before their full impact is realised. Slow growth and the insufficient development of services in some areas results to a large extent from high prices, which have in turn occurred from an absence of competitive markets. Even within a competitive market framework, it is important to be realistic as to the rate of diffusion of new technologies and services. Many of the existing technologies and services require a significant period before they can attain high penetration rates.

The development of information infrastructures is thus likely to be evolutionary as a result of factors on both the supply side and the demand side. From the supply side, new technologies need refinement, standards need to be finalised, and prices for new technologies need to fall before investment becomes profitable. New applications also take time to be developed and tested. On the demand side, users need to be persuaded of the economic value of new applications, residential users need to be convinced of the utility of new services and be willing to pay for them. As a result, governments should be wary of trying to "force-feed" the development of information infrastructures and applications.

An important area where governments can have a direct influence in applications development is through their role as large potential users of information infrastructures. The administrative functions of government can benefit to a large extent from networked applications, including local and national administration, taxation, policing and justice. Governments also have responsibility for the provision of a wide range of services to the public, ranging from healthcare, education, traffic management, and security. All these areas can benefit to some extent from networked applications both in the context of improving the efficiency and cost of service delivery but also in terms of creating economies of scale and reducing the unit costs of production.

Governments can thus play an important role in the stimulation, diffusion and development of applications by accelerating their own use of information infrastructures.

The development and use by governments of information infrastructure applications provides them with a challenge. Their use of a range of potential applications will likely in the longer term help reduce costs of service provision and improve their quality. In the short term, however, it is likely that the required expenditures will increase as a result of development and investment costs as well as the costs of transition from one form of service provision to another. In the face of the present emphasis on cutting government spending, budgetary allocations for education and health establishments and government departments may need to be reviewed in order to provide necessary investment and operating expenses.

Questions which need to be addressed include:

- What measures should governments take, if any, to encourage the growth of mass markets for networked applications of integrated voice, data and audio-visual services?
  - \* Should the role of governments be restricted to removing market barriers to private sector investment, or is a more active role required in stimulating demand to encourage growth in particular sectors?
- What is the necessary role of governments in ensuring open technology and network standards?
  - \* Do governments need to encourage the private sector to develop networks which allow high bit-rate two-way communications and the development of highly interactive service applications by a wide range of service providers and users?
- In what ways can governments reorganise their own activities to support private sector development of new applications areas?
  - \* How can governments make their own provision of services more efficient through the use of information infrastructures?
  - \* In what ways can governments support private sector R&D to stimulate the development of information infrastructures?

### **Session 3: Regulatory Frameworks for Information Infrastructures**

Regulatory restrictions on telecommunications operators offering broadcast services, as well as on broadcasting entities offering communications services, limit potential investments in information infrastructures and the development of networked applications of integrated voice, data and audio-visual services. In order to speed up investment in advanced information infrastructures increased competition in networks and services is required. However, the evolving vertical integration of the industry which would result from the removal of existing regulatory barriers also needs to be carefully regulated if it is not to result in market closure to new entrants.

The different structural characteristics of the existing sectors means that a fundamental review of existing national policy frameworks and regulatory safeguards is required if the process of

integration is to be smooth and open. The surest way to ensure that the abolition of existing regulatory restrictions results in increased competition rather than reinforced monopolies is through implementation of an extensive framework for inter-connection of and equal access to distribution networks for services. Safeguards on the design and pricing of access termination point technologies will also be important.

The need to extend and refine existing definitions of universal service has been suggested in the context of national information infrastructures which integrate different existing networks. The feasibility of doing so, the services which could be included in any new definition of universal service, the costs involved and their allocation are all important issues which need examination. In particular, the composition of any set of services established as basic to universal access will determine the level of network technology and investments which service providers will be expected to make. This in turn will set limits on the number and type of viable service providers which any given market can sustain. Minimum universal service requirements may restrict market access by creating a fixed set of costs which may be necessary for market entry and thus set a minimum level of returns required for profitability, as well as the economies of scope and scale required to achieve these returns.

Conversely, establishing a basic set of services as open to universal access also gives investors an idea of the minimum market size of investments and their returns. This may encourage investments in networks and services which may not otherwise occur. In countries with a relatively low per capita income, however, such investments may have to be made by governments in order to be viable. Governments should be cautious before making decisions on the extension of universal service and in particular in determining who will bear the appropriate costs. While it is important to avoid excluding segments of society from access to information infrastructures. It may also be appropriate to allow for greater maturity in the development of applications and network diffusion before finalising decisions on extending universal service mandates.

Security, privacy and intellectual property protection are also indispensable for realising positive economic goals and social values from the development of information infrastructures. Without these basic legal elements, growth of the infrastructure may be hampered or the infrastructure may not be used to its full potential. Confidentiality, integrity and availability of the entire infrastructure, protection of private information, and payment for use of proprietary information are all required to assure confident use of the infrastructure. Equally important, though, is that the goals of security, privacy and intellectual property protection be achieved in balance, so that solutions to one do not vitiate the other.

The issue of remuneration for use of works on the infrastructure must also be appropriately addressed, both through legal and technological measures, to encourage creative efforts to develop content for the infrastructure. Questions and concerns about the effects of information infrastructure on privacy and personal autonomy may have important economic effects on the use of the infrastructure and are closely linked to cultural characteristics. Do we import the privacy status quo of the three-dimensional world, such as it is, into the information infrastructure? Alternatively, given the nature of the information infrastructure, is greater protection of personal data and privacy required? Or, due to the properties of the infrastructure, must it be accepted that there will be a lower level of protection of personal data and privacy? All of these questions are vital to the infrastructure and have yet to be addressed.

Questions which need to be addressed include:

- What regulatory and policy reforms are needed to facilitate the growth of national information infrastructures and new network applications of voice, data and audio-visual services?
  - \* What are the difficulties governments face in ensuring that vertical integration of telecommunications and broadcasting regulatory frameworks does not lead to market closure?
- What if any set of services need to be universal to guarantee participation in the information society, and/or to encourage network and service development?
- What are the basic legal provisions for privacy, intellectual property rights and security needed to ensure that users and providers of applications can use, and are encouraged to use information infrastructures?
  - \* What are the appropriate principles for balancing the goals of individual use, commercial use and public order considerations with regard to encryption policy?
  - \* What are the best solutions to ensure remuneration for use of content?
  - \* What is the appropriate balance for protection of personal data and privacy in the information infrastructure, both on national and global levels?

#### **Session 4: From Global Information Infrastructures to Global Information Society**

In recent years much emphasis has been placed on the globalisation of OECD economies and the shift towards a global information society. The development of information infrastructures and the increasing liberalisation of international communication markets provides scope for greater integration of economies, increased economic activity and trade and greater sharing of knowledge and information through global infrastructures. The development of international information infrastructures and new networked applications of voice, data and audio-visual services is essential for the growth of international services.

Information infrastructures are undermining existing international institutional infrastructures while at the same time providing the foundation for future international markets for the exchange of goods and services. Unlike other infrastructures, information infrastructures bundle together transport, access and a universal market -- available instantly and capable of quickly arbitraging away price differentials and balancing supply and demand. It is clear that rules need to be established which both support and balance the commercial and financial forces which are being unleashed by these infrastructures.

For information infrastructures to develop at an international level requires even more definitely than at a national level that a coherent set of principles be put in place. Yet existing international institutions address telecommunications issues from different sets of economic principles in a largely uncoordinated manner. The relationship amongst the different institutions needs to be defined more clearly and forcefully at a high level -- as much as the workings of individual institutions themselves -- if issues such as open and equal access and competitive interconnection are to be established and effectively maintained. Current negotiations to liberalise

basic telecommunications and infrastructures and services must be encouraged to reach rapid conclusions and consideration may need to be given eventually to extend the scope and discussions to cover information infrastructures widely defined.

It is also important that OECD countries ensure that the developing economies are not excluded from the developing global information infrastructures and participation in a global information society. Many of the considerations concerning the social and economic impacts of information infrastructures, and the question of access to universal service, expressed in previous sessions are faced in a more acute way by developing countries. OECD countries need to consider how the development of international information infrastructures can occur in a way which does not exclude the majority of humankind, but in a way which is also economical.

Since infrastructures are, by nature, international, it would also be inefficient and perhaps counterproductive for each nation to devise individual solutions to legal questions concerning security, privacy and intellectual property rights. There is an urgent need for international debate and resolution of the necessary rules that will underpin the information highway. For example, a consensus is emerging that it may be useful and timely, both on a national and an international level, to begin a multilateral dialogue to identify principles for encryption policy.

Questions which need to be addressed include:

- What are the implications of the issues raised in the previous three sessions for international or global information infrastructure development?
  - \* Are there areas of infrastructure and applications development which need to be given priority at the international compared to the national level?
- What international guidelines may be necessary in order to avoid frictions and encourage applications for international services development between countries arising from government activities in this area?
- How can existing international organisations best work together in promoting and regulating the development of international or global information infrastructures?



## **PART IV**

### **NATIONAL POLICIES FOR INFORMATION INFRASTRUCTURES: AN OVERVIEW**

## **NATIONAL POLICIES FOR INFORMATION INFRASTRUCTURES: AN OVERVIEW**

The ICCP's Special Session will examine the economic impacts and policy issues raised by the development of information infrastructures (II) and international, or global information infrastructures (GII). This paper aims to provide an outline of positions adopted by or proposed for governments on the issue of information infrastructures.

Reports from the following OECD countries have been examined: Australia, Canada, Denmark, France, Germany, Japan, the Netherlands, Norway, Sweden, the United Kingdom and the United States. The programme of the EU is also expected to provide an integrated vision to the European Union countries. G-7 countries have started to examine the possibilities of undertaking co-ordinated actions to stimulate applications and the creation of global information infrastructures. The sources used are mentioned in Appendix A.

It should be noted that the decision-making process in many countries is still on-going. As information infrastructures develop, governments and their advisors are likely to integrate new insights in their policies, and additional reports are being prepared to address specific aspects of information infrastructures. In addition, in some countries national reports have been prepared by Ministries, whereas in others the reports have been prepared by Commissions or advisory bodies which means that the different recommendations made in the reports have not yet been adopted as policy in many cases. For the purpose of this paper, however, the existing recommendations have been used. As a consequence the paper must be viewed as a provisional overview of national initiatives, policies and reflections of the country in question.

Without exception, governments have a positive attitude towards the developments in information and communication technology. The general conviction is that they will result in economic and social benefits: information infrastructures are expected to stimulate economic growth, increase productivity, create jobs, increase the quality of services, and improve the quality of life. The opportunities provided by the new technologies enable governments to react positively to economic and social challenges. Besides the similarities, however, there are also differences. First, programmes adopt different priorities for the development of information infrastructures. Some focus mainly on services and applications while others primarily discuss networks and infrastructures. Second, the programmes take the country's specific economic, cultural and social situation as a starting point.

In the sections that follow, the policies proposed to or adopted by different governments are outlined in relation to the issues to be discussed at the Special Session.

### **Session 1: The Economic and Social Impacts of Information Infrastructures**

All programmes stress the economic benefits of information infrastructures. Its development is expected to stimulate economic growth, create high-skilled jobs, and increase productivity, both in the private and public sector.

## *Economic growth*

In Japan it has been estimated that by building a nation-wide fibre optic network for broadband (fibre-to-the-home), the multimedia market plus regular telecom market will attain a level of approximately 123 trillion yen (US\$ 1 230 billion) in 2010, the year in which the construction of the network is proposed for completion (MPT p. 13-14). The United States estimate that the National Information Infrastructure will create as much as US\$ 300 billion annually in new sales across a range of industries (US p. 13). The other programmes forecast economic growth, however, without giving estimates of its magnitude.

The content industry is envisioned to be one of the most dynamic sectors to develop. Services like video-on-demand and interactive games are expected to boost the entertainment and audio-visual industry. Publishers and information providers will be able to develop new products and services based on broadband networks. New technologies provide new opportunities for sector-specific services like education, training, healthcare and other services.

Building new networks and expanding existing ones is also seen as a major stimulus for the economy. In the United States expenditures between US\$ 50 and US\$ 100 billion are expected to upgrade telecommunication facilities for the National Information Infrastructure, while in Japan it is estimated that it is necessary to spend an annual average of about 1 trillion yen (US\$ 10 billion) to build an information infrastructure before the year 2010 (Japan p. 46). In France, to build a fibre network to every household by the year 2015 is estimated to cost between FFr 150 billion and FFr 200 billion (between US\$ 30 billion and US\$ 40 billion) (France p. 102).

To access the information and communication services, customer premises equipment like PCs and interactive terminal equipment will be needed. In 1993, OECD total hardware expenditure for information technology was US\$ 132 billion (IT Outlook 1994, p. 22). Although no estimates have been made by the different countries for expenditures in this area, it is most likely the market for customer premises equipment will grow on a steady basis as the information society develops. Indications of these developments were already present in 1994: in this year the world-wide personal computer market grew 20 per cent, driven by a vibrant home market and competitive pricing.

Information and communications technologies have been impacting on user industries for some time. These technologies provide possibilities to rationalise production and service delivery and increase productivity, both in the public and private sector. Estimates made in the United States indicate an increase of productivity by 20 to 40 per cent by the year 2007 (US p. 13).

One sector mentioned in national programmes in particular for reducing costs while increasing the quality of service is in health care. Costs in this sector have been increasing constantly and are expected to continue to increase in the future. Information infrastructures are viewed as providing the possibility to alter this trend. For instance, by using Electronic Data Interchange (EDI) to manage information flows between clinics, practitioners and insurance companies, dramatic cost reductions are foreseen. Potential cost reduction is also expected from Telemedicine and Personal Health Information Systems (US, p. 14, 15).

The OECD public telecommunication service sector generated revenues of US\$ 395 billion in 1992 amounting to some 2 per cent of GDP. Investment by public operators has averaged around 3 per cent of gross fixed capital investment for OECD countries, amounting to some US\$ 102 billion in 1992 (Communications Outlook 1995). The development of information infrastructures will stimulate

this market and is expected to increase the share of these industries, according to some estimates, to between 10-15 per cent of GDP.

### ***Employment***

Significant increases in economic activity are expected from the development of information infrastructures and related applications in all countries and it is expected that there will also be a positive effect on employment. Japan, for instance, expects employment in the multimedia sector to outnumber that in its automobile industry and generate 2 430 000 jobs by the year 2010 (MPT p. 13-14). The United States expects as many as 300 000 jobs in the next 10-15 years to be created in the Personal Communications Services Industry (US p. 13). Estimates made in France envision the number of employees in the information services sector to double by the year 2015 up to 600 000 (France p. 57). Other national programmes also predict job creation as a result of the development of information infrastructures, especially in new content industries, although estimates are not provided.

National reports do not specify to what extent estimates of job creation constitute a net increase in jobs taking into account any negative impacts information infrastructures may have on employment. It is important for governments to be aware of the potential of information infrastructures to reduce as well as create employment and ensure that appropriate policies are in place, especially retraining, to compensate for this impact.

### ***The geographical impact***

Traditional production of goods and delivery of services has been tied to geographic areas because of the need for skilled labour, access to certain information, and customer markets. For this reason most economic activity is centred in and around urban areas. Information infrastructures provide development opportunities in rural areas while at the same time providing opportunities to reduce or reverse over-concentration in urban areas. Norway and Sweden, for instance, with their sparse population and considerable distances, envision new opportunities for rural areas by exploiting information technologies (Norway, Sweden p. 24). Japan also mentions new opportunities for its regions which might take some pressure off the Greater Tokyo Metropolitan Area (MPT p. 8).

### ***Social and cultural implications***

As discussed earlier, information infrastructures are considered to provide potential benefits to the economy. But the promises of information infrastructures go beyond this, since they are also viewed as providing opportunities to address social challenges. For instance, information infrastructures may enable a certain level of service to be maintained in rural and sparsely populated areas through using remote delivery of services such as distance education or telemedicine (US p. 14, MPT Japan p. 8, Norway) People with special needs, such as the elderly and the disabled, will have more possibilities to participate in society (MPT Japan p. 7, Denmark p. 97, Germany p. 4, Norway). Information infrastructures provide a tool to reduce environmental damage by reducing the use of paper (MPT p. 12), reduce traffic by using teleworking (Bangemann p. 25, Germany p. 18, Norway), and increase efficiency of traffic flows through the use of traffic information systems (MPT p. 10, Denmark p. 77, Bangemann p.27).

In general, the widespread use of information infrastructures is expected to have a significant social impact by transforming the way we live, work and play. For instance, as a consequence of the development of flexible firms the working environment is expected to change. This affects skills required from employees, the content of jobs or the geographic location from where work is done. Constant change requires constant updating of knowledge and skills (life-long learning). Present working time arrangements can be transformed into more flexible ones using information infrastructures.

Specific attention is given in national reports and policy papers to the potential threat of a two-tier society of "haves" and "have-nots": those familiar with the use of information infrastructures and who therefore are able to participate in and benefit from the information society, and those not familiar with the technology or unable to obtain access to it (Denmark p. 16, 29, Bangemann p. 6, Germany p. 10, US p. 8). To avoid this threat, countries want to ensure that information infrastructures are available to all by expanding the concept of universal service. Education and training is another fundamental element in preparing people for the information society.

### ***Education***

For a number of reasons the implementation of information infrastructures in education is considered to be important. First of all, by using information infrastructures new and better forms of education and training are possible. These infrastructures enable institutions to support a more diverse range of curricula activity and reduce their dependency on local teaching resources. Teachers and students can have access to a greatly expanded range of educational material on the network. Information infrastructures allow for distance education or remote learning regardless of location or time, reducing restrictions on access to education services (Bangemann p. 25, Netherlands p. 19, Australia interim report p. 23, US p.17, Denmark p. 59-60, Canada p. 9, Germany p. 4, Norway, Sweden p.10-11, UK p. 8).

By using information infrastructures in education and training, school children, students and employees become familiar with the technology. For the individual this is important given the need to work and live in a society that is more and more based on information technology: for enterprises it is important to have human resources capable of using and/or developing new information services in order to stay competitive nationally and internationally (MPT p. 53, US p. 16, Sweden p. 10, Canada p. 31, Bangemann p. 6). Most OECD countries have started or will start building networks linking schools, integrating computer-based education material as well as starting pilot projects for various specific educational and training applications. References in national reports to the protection of culture and language applies particularly to education. Several countries emphasise the necessity of developing applications based on the national identity i.e. culture and language (Sweden p. 11, Denmark p.29).

### ***Demand***

The promises of information infrastructures are significant. However, much of their impact will depend on the development of demand. In the past, various new technologies have developed mass-markets in a relatively short time, whereas others have taken decades or have not really taken off. In general, preconditions for the successful introduction of new technologies are related to user-friendliness of both hardware and software, their prices, the extent to which these technologies meet customer's needs, and the existence of substitutes. Given the scope and complexity of the issues

involved in information infrastructures there are a number of analysts who believe that it will take at least one generation before the information society can be considered mature. The transformation towards an information society must as a result be considered evolutionary rather than revolutionary. This may imply that estimates concerning economic growth might at this stage be rather optimistic.

## **Session 2: Market Development and New Applications**

### *The physical infrastructure*

Information infrastructures are largely based on broadband communication technologies. Unlike existing networks which are restricted as to the datastreams they can carry, broadband networks can carry integrated data, video, text and voice traffic and therefore have the capability to carry multimedia services and allow interactivity. There is still insufficient consensus as to whether information infrastructures require fibre to the home, fibre to the curb, or whether other network architectures are appropriate. Rapid technological developments in transmission technologies (compression techniques) suggest that a sufficiently high data rate may be obtained to satisfy many requirements without immediately investing in fibre-to-the-home. This, together with the existing costs of investing in fibre and uncertainty about residential demand, is a major reason why private investors are cautious and often choose to upgrade existing networks rather than investing in fibre-to-the-home on a mass scale.

Most OECD countries discuss the appropriate technologies for the delivery of applications over information infrastructures only in terms of trends and developments, and leave the decision on specifics in the hands of industry. For example, the United Kingdom's report stresses the fact that: "The government considers efficient infrastructure is best developed by competing providers, rather than by promoting a single all purpose switched two-way infrastructure.. .A competitive environment tends to reduce the gap between the development and the deployment of new technologies, products and services, thereby rapidly increasing the products and services available to customers. It is worth noting that there is a good deal of debate -- and disagreement -- as to how highly developed communications networks will need to be, and how fast new, interactive services will be taken up. A key advantage of competition in infrastructure and services is that market pressures promote innovation, investment, and experimentation." (UK p. 4-5).

On the other hand, proposals have been made for active support and stimulation by governments in the extension of broadband networks. The most far-reaching proposals have been made in Japan and France, where it has been recommended to invest in fibre-to-the-home to be completed, respectively, by 2010 and by 2015 (MPT p. 27, France p. 108). Both countries are stimulating the development of cable television networks (MPT News, October 31, 1994). The European Commission has proposed a series of guidelines as well as a multi-year action plan for the development of ISDN as a trans-European network. In addition, the concept of a European Integrated Broadband Communications infrastructure is being promoted.

Many governments also see a need to establish general frameworks or visions for the development of applications. Following the recommendations of the Bangemann Group, the Commission is setting up a European Broadband Steering Committee involving all relevant actors to develop a common vision and to monitor and facilitate the realisation of overall concepts through, in

particular, demonstrations, and choice and definition of standards (EU p. 8, Bangemann p. 21). In the United States, the National Telecommunications and Information Administration has been holding hearings around the country to get the views of interested parties on the National Information Infrastructure initiative, and has established the Information Infrastructure Task Force and Advisory Committee to obtain and co-ordinate the views of government agencies and the private sector. Australia established a Broadband Services Expert Group and the Communications Futures Project to define the impact of developments in information and communication infrastructures and applications for Australian business and society. Governments promote the use of information infrastructures and raise awareness of the possible benefits (Bangemann p. 26, Denmark p. 80, Norway, UK p. 16). Governments also have constant dialogue with, among others, the private sector to exchange visions and positions (Canada p. 13, Germany p. 14, UK p. 10, US p. 7)

### *Applications*

In regard to the development of information and communication applications governments, in general, see their role as facilitating and stimulating the development and use of applications by putting the appropriate regulatory frameworks in place which are based on a competitive market.

There is a range of multimedia products and applications being developed for different markets. It is generally agreed that public assistance needs to be minimised and that the private sector already has the experience to exploit various applications in order to improve the goods or services delivered, increase productivity, reduce the 'time to market', and enhance flexibility and competitiveness.

The residential market, already an important consumer of information, communication services, and entertainment services, may become one of the principal driving forces in the development of information infrastructure markets. This would provide the necessary critical mass for new information and communication services (Bangemann p. 9, MPT p. 29). Entertainment applications such as video-on-demand, and interactive games are considered to be the most promising areas (Australia interim report p. 27, Denmark p. 69-75, 94, Bangemann p. 10). Other applications for this market are, for example, teleshopping and teleworking. Teleworking is an application governments show special interest in, mainly to reduce commuting traffic.

The public sector, as a large potential user of information and communication services, can stimulate the development of information infrastructures through providing the critical mass for new service applications. By becoming leading-edge users of information infrastructure applications, governments would be able to set an example and show the benefits of these technologies and applications to society as a whole. For instance, the use of information infrastructures is viewed as enabling an improvement of public services, reduced costs and improved flexibility. But the potential benefits go beyond economic-driven objectives as they can contribute to a more transparent, responsive public administration with services better accessible for the public (Canada 9, US p. 17, Sweden 14, Denmark p.33-44, Germany p. 18, Norway, UK p. 17, MPT p. 10, Netherlands p. 20, Australia interim report p. 21-23, Bangemann p.5).

### ***Testbeds***

In various cases governments are participating in pilot projects and testbeds to demonstrate the potential of information infrastructures and stimulate their development by working closely together with all the actors involved. For some years now the European Union has supported the development and deployment of networks and applications, including telematic services for small and medium-sized enterprises, telematic applications for transport in Europe, trans-European public administration networks, and urban information highways (EU p. 12). In order to stimulate the development of information infrastructures most countries have pilot projects, in some cases assisted through government funding. The G-7 countries have launched a number of joint projects on a global level to be initially undertaken by the G-7 partners, but which will become open to all countries. The 11 pilot projects include a global inventory of information regarding major national and international projects and studies relevant to the promotion and development of the global information society; facilitating the establishment of international links between the various high speed networks and testbeds supporting advanced applications; cross-cultural education and training; electronic libraries; electronic museums and galleries; healthcare applications; and government online (Chair's conclusions issued by the G-7 Ministers, 27 February 1995).

### ***Research and Development***

Research and development has contributed to the development of information infrastructures. At the same time information infrastructures have enabled scientists to improve and expand their research, often interacting with colleagues all over the world, sharing data and information regardless of their geographical location. All OECD countries are aware of the importance of research and development in general, and information infrastructures-related R&D in particular. Governments are supporting this by increasing or reallocating existing funding to information technology-based areas (Denmark p. 57, Canada p. 11, Bangemann p. 30, EU p. 10, Germany p. 14-15, MPT p. 47, Norway, US p. 23, UK p. 10).

### ***Standardisation***

To maximise the potential provided by information infrastructures, interoperability of networks must be attained on a national and an international level. Standardisation is essential to achieve interconnection and interoperability. Being aware that setting standards can provide a competitive advantage, governments want to co-operate more closely with industry and standardisation agencies (US p. 9, Sweden p. 19, MPT p. 54-55, Canada p. 24, Australia interim report p. 54, Denmark p. 83, Norway).

### ***Financing***

In general, OECD countries consider financing information infrastructures to be primarily the responsibility of the private sector. By introducing or further expanding competition private investment will be stimulated, ensuring cost-effectiveness, lower prices as well as improved and widened services (UK p. 1, US p. 7-8, Netherlands p. 8, 12-13, Sweden p. 18, Australia interim report

p. 10, Canada p. 13, EU p. 10). Governments also stimulate private investment by providing tax incentives, and loan guarantees (US p. 8, MPT p. 46, EU p. 10, Germany p. 11).

Commercially non-attractive projects, for instance in rural areas or specific facilities for the disabled and the elderly, might have difficulty in obtaining private investment funds. In these cases OECD countries consider additional public funding or provide grants for non-profit institutions (Canada p. 13, Australia interim report p. 57-58, US p. 23).

### ***Pricing***

As experience has shown, competition is important in reducing prices. However, existing telecommunication tariff structures for access and use of information infrastructures, especially in monopoly markets, hinder rather than stimulate the development of a dynamic markets. Even in many markets that have recently liberalised prices may be insufficiently low to stimulate new applications. The national reports studied do not analyse the issue of tariffication.

## **Session 3: Regulatory Frameworks for Information Infrastructures**

Although many of the developments described are already taking place, the real take-off of information infrastructures and the information society has yet to come. Governments are now in a position to facilitate and accelerate these developments, as well as anticipate and counter any undesirable side-effects. To guide their strategies and objectives, most countries have put forward a set of principles. The 5 main principles which several OECD countries agree with are:

### ***i) Open access***

In order to realise the economic and social objectives set by governments, full access to networks and the information transmitted over these networks is a necessity for service providers and users alike. Specific regulatory and technical conditions to enable interconnection of networks and interoperability of services at the national and international level is essential (EU p. 4, MPT p. 52, USA p. 9, Sweden p. 18, Canada p. 13, Denmark p. 25, Norway).

### ***ii) Encourage private investment***

The private sector must play the leading role in developing the information infrastructures. Government's role is to encourage private investment by creating a suitable environment: competition and tax incentives are part of this policy (Australia interim report p. 55, 57, Bangemann p. 8, EU p. 3, Canada p. 13-14, Germany p. 19, MPT p. 46, 50, USA p. 7-8, Sweden p. 7, UK p. 15). In some cases governments consider additional funding to ensure all its citizens are being served (Canada p. 13, Netherlands p. 24, Denmark p. 24).

### ***iii) Promote competition***

It has increasingly become accepted by OECD countries that opening-up markets to competition in telecommunication equipment, services and networks stimulates the development of information infrastructures by reducing prices and tariffs, stimulating private investment, and

improving and stimulating new services (UK p. 1, 4, Sweden p. 18, US p. 8, EU p. 3, Bangemann p. 8, 12, Canada 13-14, Netherlands p. 12-15, Australia interim report p. 10, MPT p. 47, 50, Denmark p. 86-87, Germany p. 11).

For this reason, countries with partly liberalised telecommunication markets are expanding competition in areas up to now reserved to monopolies. The United States, for example, is reforming communication legislation to allow competition in cable television and local telephony markets (US p.8). Japan will review its current regulatory framework, which already allows competition in all fields of the telecommunication industry, to further promote private sector activities (MPT p. 49). Canada will apply pro-competitive policies, to the greatest extent possible in all aspects of the information highway (Canada p. 13). Australia also promotes competition wherever appropriate (Australia interim report p. 10).

Apart from the United Kingdom, Sweden and Finland -- who have already liberalised telecommunication markets -- European Union members will adopt a regulatory framework which allows for competition in telecommunication services and infrastructures as from 1 January 1998. Some countries have an additional transition period. The Netherlands has decided to partly open its telecommunications market earlier by allowing a second fixed link operator to enter the market as from the end of 1995 (Netherlands p. 12-13).

#### *iv) Ensure universal service*

All countries believe that participation in the information society must be ensured through the availability of information infrastructures to all at affordable prices. To achieve this the current concept of universal service must be expanded (US p. 8, Australia interim report p. 10, Canada p. 13, MPT p. 51, Norway, Sweden p. 18, EU p. 5, Denmark p. 24, Germany p. 10, UK p. 18, France P. 117). However, national reports do not go into detail as to the scope of an expanded universal service concept or the type of financing mechanism envisaged.

#### *v) Effective regulatory framework*

Governments must provide an effective legal and regulatory framework which stimulates the development of information infrastructures. Regulation and legislation must be effective in the sense that they provide an environment in which information infrastructures can fully develop. Important issues in this respect are the convergence of telecommunication and broadcasting, the security of information systems, the protection of personal data and the privacy of individuals, and intellectual property rights (Australia interim report p. 10, Canada p. 13, UK p. 11, 20, Norway, Sweden p. 13-14, Germany p. ii, Netherlands p. 11, 15, MPT p. 49, 53, US p. 9, France p. 48).

As a result of technological developments, historical distinctions between the characteristics of the telecommunication, broadcasting and computing industries are gradually disappearing. This enables cable television companies to provide telephony services and public telecommunication operators to provide services like interactive television and video-on-demand. Separate regulation of telecommunication and broadcasting, however, hinders the convergence of these sectors, and through this new economic activities. In order to enable the growth of an integrated services market many OECD countries are in the process of reviewing their legal and regulatory framework (MPT p. 51, Netherlands p. 15, Denmark p. 71, US p. 8, Australia interim report p. 51, Germany p. 12, Norway, Sweden p. 14). Although many OECD countries underscore the importance of safeguarding their

culture and language, existing regulations in the field of entertainment, notably in broadcasting, will probably be adjusted to meet the requirements of the new information services.

With the widespread use of information infrastructures in modern societies, protection of privacy and personal data as well as the security of information systems must be assured in order to maintain public confidence. Another challenge concerns defining intellectual property rights which provide the right balance between protecting right holders of content, on the one hand, and the free circulation of information and knowledge, on the other. Realising the development of information infrastructures depends on solutions acceptable to all actors involved, and OECD countries consider these issues to be of high priority and address them both on a national level and an international level (UK p. 20-21, Canada p. 14, US p. 9-10, Australia interim report p. 73-79, MPT p. 53, Denmark p. 45-46, Germany p.10, Norway, Sweden p. 13, Netherlands p. 11, France p. 100-101).

### ***Timetable***

Many countries have published a time schedule for the completion of various proposed policy initiatives. The scope of these initiatives, however, varies. For instance, the proposals made in France have suggested a goal to finish the building of the network infrastructure for the year 2015, the Japanese report recommends completion of the network by the year 2010 (France p. 108, MPT p. 35). The Australian Expert Group recommends broadband links be provided to all schools, libraries, medical and community centres by the year 2001 (Australia final report p. 60). In the United States the aim is for all classrooms, libraries, hospitals and clinics to be connected to the national information infrastructure by the year 2000 (Administration White Paper on Communications Act Reforms p. 5). The Danish government wants networks and information services such as electronic mail and EDI operational in both the public and private sector before the year 2000. Various concrete actions, mainly in the public domain, are scheduled in the next few years (Denmark p. 28-29). Sweden has also published several actions in the public domain to be finished within the next few years (Sweden p. 11, 13, 15,). The Netherlands has published a timetable concerning adjusting and reviewing its legal and regulatory framework in the period 1994-1998 (Netherlands p. 13-17).

## **Session 4: From Global Information Infrastructures to Global Information Society**

### ***International competition***

It is recognised by all countries that their national economies will benefit if the potential of information infrastructures is exploited, and that they will lose their competitiveness if they lag behind. The United States points out that information infrastructures will help U.S. businesses remain competitive (US p. 5). The Bangemann report states in this context that the first countries to enter the information society will reap the greatest rewards and will set the agenda for the countries who must follow. The report also stresses that countries which temporise, or favour halfhearted solutions are likely to face disastrous declines in investment and a squeeze on jobs (Bangemann report p.5). A similar statement is made by Australia where it is argued that the development of broadband services and networks needs to be encouraged to maintain that country's international competitiveness (Australia interim report p. 5). Canada also states that to succeed in a global economy based on information, the national communications networks must be knitted into a seamless and powerful information infrastructure serving all Canadians. If Canada does not match the efforts of its competitors in accelerating infrastructure development, opportunities for network, product and

service development -- and the resulting economic growth and new jobs -- will be seized by firms in other countries (Canada p. 5).

But countries also stress the international benefits of information infrastructures. One of the main characteristics of the information society is globalisation. Flows of goods, services and information provide opportunities for cultures to meet and learn from each other (MPT p. 3). New information technologies give more opportunities for expression of the multiplicity of cultures and languages (EU p. 11). Culture in itself can be exported, contributing to economic growth and job creation (Australia interim report p. 43, Canada p. 20).

When it comes to importing these cultural products, however, there are some countries that regard this as a threat. Countries have emphasised the need to protect their culture and language (Canada p. 11-12, Denmark p.73, Sweden p.7, 25).

### ***Building on national strength***

Most countries have identified their national strengths and based their action plans on them. The existing national telecommunication infrastructure is considered to be a valuable asset on which the future information society can be built. Other pillars mentioned include: medico-technical industries (Denmark), publishing sector (The Netherlands, The United Kingdom), IT industry (Canada, US), financial sector (Denmark, the Netherlands), electronics sector (US).

Some countries view that their strength can also lie in their policy structure -- both Sweden and the United Kingdom consider their regulatory and policy framework which put privatisation and liberalisation in place, as a competitive advantage. Other national strengths include a highly-skilled and highly-educated labour force (Australia, the Netherlands), and the widespread use and knowledge of information technology (Denmark).

## APPENDIX A

- Australia: Networking Australia's Future (July 1994, Broadband Services Expert Group, Interim report)
- Networking Australia's Future (December 1994, Broadband Services Expert Group, Final report)
- Canada: The Canadian information highway; building Canada's information and communications infrastructure (April 1994)
- Denmark: Info-society 2000 (November 1994)
- European Union: Europe and the Global Information Society: Recommendations to the European Council (Bangemann Group, 26 May 1994)
- Europe's way to the information society. An action plan (European Commission, 19 July 1994)
- Green Paper on the liberalisation of telecommunications infrastructures and cable television networks part II
- France: Les autoroutes de l'information (Gérard Théry, 1994)
- Germany: Multimedia: Chance und Herausforderung (Multimedia: opportunities and challenges) (March 1995, Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie)
- Japan: Reforms toward the intellectual creative society of the 21st century: Programme for the establishment of high-performance info-communications infrastructures (31 May 1994, Telecommunications Council, Ministry of Post and Telecommunications)
- Programme for advanced information infrastructure (May 1994, Ministry of International Trade and Industry)
- The Netherlands: Actieprogramma Elektronische Snelwegen - van metafoor naar actie (Action programme Electronic highways - from metaphor to action) (December 1994)
- Norway: Norwegian information infrastructure (6 March 1995)
- Innspill til norsk bidrag til informasjons-infrastruktur (Proposal for a national Information Network) (25 January 1995)

Sweden: Information technology: wings to human ability (August 1994)

United Kingdom: Creating the superhighways of the future: developing broadband communications in the UK (November 1994)

United States: The national information infrastructure: agenda for action (15 September 1993)

National information infrastructure: progress report September 1993-1994

Global Information Infrastructure: agenda for cooperation (February 1995)

G-7: G-7 ministerial conference on the information society: theme paper (Brussels, 23 January 1995)

Chair's conclusions issued by the G-7 ministers (27 February 1995)

## **PART V**

### ***PROGRAMME***

**3-4 April 1995, OECD, Paris**



## **SESSION 2**

### **Market Development and New Applications**

15.00 - 18.00 (break 16.20-16.40)

This Session will examine the structural requirements for developing information infrastructures markets and applications through optimising the integration of different voice, data, and video networks, the role of government and the private sector as leading-edge users and promoters of pre-competitive R&D, in setting open technology standards, network architectures and pricing structures.

Themes: Development of Applications, Technological and Pricing Structures, Role of Government as leading-edge User and promoter of R&D and Standards.

**Chairperson:** **Mr. Bruno Lamborghini**, Head, Studies and Strategic Planning, Olivetti, Italy

Speakers:

**Mr. Risaburo Nezu**, Deputy Director General for Negotiations, International Trade Policy Bureau, Ministry of International Trade and Industry, Japan

**Mr. Robin Foster**, Chief Advisor, Commercial Policy, BBC, United Kingdom

**Mr. Henri Serres**, Director, General Directorate for Industrial Strategies, Department of Communication and Service Industries, Ministry of Industry, Post and Telecommunications and Trade, France

**Mr. Ken Leeson**, Director, Regulatory Affairs, IBM Global Network, BIAC

**Mr. Berth Eklundh**, Director, Corporate Business Development, LM Ericsson, Sweden

**COCKTAIL** (approx. 18.15 )

## **SECOND DAY**

**4 April 1995**

## **SESSION 3**

### **Regulatory Frameworks for Information Infrastructures**

9.30 - 12.30 (break 11.00-11.15)

The aim of this Session is to examine the appropriate framework in order to benefit from the opportunities provided by information infrastructures. Existing national regulatory frameworks may require a fundamental review to facilitate the developments.

Themes: Appropriate Regulatory Principles, Merging of Communication and Broadcasting Frameworks, Universal Service, and Legal Frameworks

**Chairperson:** **Ms. Elena Salgado**, Secretary General, General Secretariat of Communications, Ministry of Civil Works, Transport and Environment, Spain

Speakers:

**Mr. Bruno Lasserre**, Director General, Directorate for Post and Telecommunications, Ministry of Industry, Post and Telecommunications and Trade, France

**Ms. Susan Ness**, FCC Commissioner, United States

**Mr. Eugenio Triana Garcia**, Advisor Hors Classe, DGXIII, European Commission

**Ms. Fay Holthuyzen**, First Assistant Secretary, Telecommunications Industry Division, Department of Communications and Arts, Australia

**Professor Jon Bing**, University of Oslo, Institute of Law and Informatics, Norway

### LUNCH

**SESSION 4**  
14.30 - 16.45

**From Global Information Infrastructures to  
Global Information Society**

The development of national information infrastructures and the increasing liberalisation of international communication markets provides scope for greater integration of economies, increased economic activity and trade and greater sharing of knowledge and information through global infrastructures. This session will examine appropriate principles that need to be in place for these developments to take place successfully worldwide.

Themes: Appropriate Regulatory Frameworks and Principles, Co-operation and Competition, and Developing Economies

**Chairperson: Mr. Peter Fischer**, Federal Office for Communications, Switzerland

Speakers:

**Ambassador Vonya McCann**, State Department, United States

**Mr. Yoshio Utsumi**, Director General, International Affairs Minister's Secretariat, Ministry of Posts and Telecommunications, Japan

**Mr. Neil McMillan**, Department of Trade and Industry, United Kingdom

**Mr. Bert de Ruiter**, Director, Government and Intercompany Relations, Unisource NV, Netherlands

**Mr. Alan Nymark**, Assistant Deputy Minister, Industry and Science Policy, Industry Canada

### Observations for future work by chairman of the Steering Group:

**Mr. Jerker Torngren**, Chairman of the Working Party on Telecommunications and Information Services Policy

**CLOSING STATEMENT by ICCP Chairman**

**Rapporteur: Jens C. Arnbak**, Professor of Information and Communication Technology, School of Systems Engineering, Policy Analysis and Management, Delft University of Technology.



## **PART VI**

### **LIST OF PARTICIPANTS**

## **LIST OF PARTICIPANTS - LISTE DES PARTICIPANTS**

### **CHAIRMAN - PRESIDENT**

Mr. Richard C. BEAIRD  
Deputy U.S. Coordinator and Deputy Director  
Bureau of International Communications  
and Information Policy  
U.S. Department of State  
Washington D.C.  
(United States)

### **AUSTRIA - AUTRICHE**

Mr. O. HELLWIG  
Head of Division for IT Co-ordination  
Federal Chancellery

Mr. R. FRIES  
Conseiller  
Ministry for Science, Research and the Arts

Mr. C. SINGER  
Ministry for Public Economy and Transport

Mr. Wolfgang ZEHETNER  
Economic Ministry - TELE

Mr. OHLER  
Austrian Research Centre - Seibersdorf  
Department of Technology Studies

Mr. Wolfgang POLT  
Austrian Research Centre - Seibersdorf  
Department of Technology Studies

### **AUSTRALIA - AUSTRALIE**

Ms. Fay HOLTHUYZEN  
First Assistant Secretary  
Telecommunications Industry Division  
Department of Communications and the Arts

Mr. James CAMERON  
Assistant Director  
Competition Policy Section  
Telecommunications Industry Division  
Department of Communications and the Arts

Mr. Gordon NEIL  
Counsellor Industry, Science & Technology  
Permanent Delegation / Délégation Permanente

Ms. Anna NEMANIC  
Research Officer  
Counsellor Industry, Science & Technology  
Permanent Delegation / Délégation Permanente

## **BELGIUM - BELGIQUE**

Mr. J-P. LAMBOTTE  
Ingénieur - Conseiller Général  
BELGACOM S.A.

## **CANADA**

Mr. A. NYMARK  
Assistant Deputy Minister  
Industry and Science Policy  
Industry Canada

Mr. D. JOHNSTON  
Chairman, Information Highway Advisory Council  
Industry Canada

Mr. M. TIGER  
Senior Policy Adviser  
International Telecommunications Relations  
Industry Canada

Mr. A. BERGREEN  
Senior Manager Government Relations  
Nortez World Trade  
Northern Telecom EU Liaison Office

Ms H. GOSSELIN  
Senior Analyst  
Policy Integration  
Strategic Policy  
Planning and Consultation  
Industry Canada

Mrs M. RALETICH-RAJICIC  
Counsellor  
Permanent Delegation / Délégation Permanente

## **DENMARK - DANEMARK**

Mr. P. L. NIELSEN  
Deputy Permanent Secretary  
Ministry of Research and Information Technology

Mr. J.U. DALGAARD  
Senior Advisor  
Ministry of Research and Information Technology

Mr. O. KIRKEBAEK  
Adviser  
Ministry of Research

## **FINLAND - FINLANDE**

Mr. I. PIETARINEN

Finance Councillor  
Ministry of Finance

Ms. M. EROLA

Programme Manager  
Technology Development Centre

Ms A. LAMBERG

Head of Unit  
Information Network Unit  
Ministry of Transport and Communications

Mr. M. LÄHDEOJA

Counsellor  
Permanent Delegation

Mr. K. PERE

Ministry of Transport and Communication

## **FRANCE**

Mr. B. LASSERRE

Directeur Général  
Direction Générale des Postes et Télécommunications  
Ministère de l'Industrie, des Postes et  
Télécommunications et du Commerce Extérieur

Mr. H. SERRES

Directeur du SERICS  
Direction Générale des Stratégies Industrielles  
Ministère de l'Industrie, des Postes et  
Télécommunications et du Commerce Extérieur

Mr. G. de MAISTRE

Directeur adjoint du SERICS  
Direction Générale des Stratégies Industrielles  
Ministère de l'Industrie, des Postes et  
Télécommunications et du Commerce Extérieur

Mr. D. HUCK

Sous Directeur du SERICS  
Direction Générale des Stratégies Industrielles  
Ministère de l'Industrie, des Postes et  
Télécommunications et du Commerce Extérieur

Mlle Florence TORDJMAN

Administrateur Civil  
SERICS  
Direction Générale des Stratégies Industrielles  
Ministère de l'Industrie, des Postes et  
Télécommunications et du Commerce Extérieur

Mr. P. PROFIZI

Direction Générale des Postes et Télécommunications  
Ministère de l'Industrie, des Postes et  
Télécommunications et du Commerce Extérieur

**FRANCE** (continued/suite)

Ms. M-O. BEAU  
Direction Générale des Postes et Télécommunications  
Ministère de l'Industrie, des Postes et  
Télécommunications et du Commerce Extérieur

**GERMANY - ALLEMAGNE**

Mr. E. MANNHERZ  
Head of Delegation  
Deputy Director General  
Ministry of Economics

Dr. H. FEST  
Deputy Director General  
Federal Ministry of Economics

Mrs I. RÜDE  
Head of Division  
Federal Ministry of Education, Science,  
Research and Technology

Mr. POETSCHKE  
Head of Department  
Ministry of Economic Affairs

Mr U. MULLER  
Deputy Head of Section  
Ministry of Economics

Mr. T. GAECKLE  
Delegate  
Ministry of Economics

Mr. M. SCHULZ  
Counsellor  
Permanent Delegation / Délégation Permanente

Mr. D. ZANGERL  
Attaché  
Permanent Delegation / Délégation Permanente

**ITALY - ITALIE**

Mr. B. LAMBORGHINI  
Chef du Service d'études et de planification stratégique  
Olivetti

Mr. C. SARZANA  
Magistrat-Président Adjoint  
de la Chambre des Juges des Enquêtes Préliminaires  
Tribunal de Rome

Mr. M. CARLI  
Chief Manager  
Post and Telecommunications Ministry

Mr. A. FOGLIATI  
Regulation and Tariff Department  
STET

**ITALY - ITALIE** (continued/suite)

Mr. G. AMENDOLA  
Strategies and Studies Department  
STET

Mr. Sergio SABBADINI  
Attaché Scientifique  
Permanent Delegation / Délégation Permanente

**JAPAN - JAPON**

Mr. S. ASANO  
Professor  
National Center for Science Information Systems

Mr. Y. UTSUMI  
Director-General of International Affairs Dept.  
Minister's Secretariat  
Ministry of Posts and Telecommunications

Mr. M. TAKAHASHI  
Director of International Organizations Division  
International Affairs Dept.  
Minister's Secretariat  
Ministry of Posts and Telecommunications

Mr. J. OKAYAMA  
Senior Adviser of General Co-ordination Division  
Minister's Secretariat  
Ministry of Posts and Telecommunications

Mr M. YOSHIDA  
Deputy Director of International Policy Division  
International Affairs Department  
Minister's Secretariat  
Ministry of Posts and Telecommunications

Mr. Y. TANAKA  
Assistant Director of International Organizations Division  
International Affairs Department  
Minister's Secretariat  
Ministry of Posts and Telecommunications

Mr K. FUJII  
Research Officer  
Office of Information Systems Studies  
Institute for Posts and Telecommunications  
Ministry of Posts and Telecommunications

Mr. R. NEZU  
Deputy Director-General for Trade Negotiations  
Minister's Secretariat  
Ministry of International Trade and Industry

**JAPAN - JAPON (continued/suite)**

Mr. J. ASANO	Deputy Director Information Services Industry Division Machinery and Information Industries Bureau Ministry of International Trade and Industry
Mr. S. ISHIMASA	Deputy General Manager Office of International Affairs The Japanese Information Centre of Science and Technology
Mr. M. NISHIKORI	Research Officer Industrial Economic Affairs Division Coordination Bureau Economic Planning Agency
Mr. S. KOBAYASHI	Industrial Economic Affairs Division Coordination Bureau Economic Planning Agency
Mr. M. YOSHIDA	Deputy Director 2nd International Organizations Division Economic Affairs Bureau Ministry of Foreign Affairs
Mr. T. NAKAMOTO	Minister Permanent Delegation / Délégation Permanente
Mr. A. KUBOTA	Counsellor Scientific Affairs Permanent Delegation / Délégation Permanente
Mr. M. AKIBA	First Secretary Education Permanent Delegation / Délégation Permanente
Mr. Y. YASUMURA	First Secretary Telecommunications Permanent Delegation / Délégation Permanente
Mr. M. TANIGUCHI	Manager NTT France S.A.
Mr. S. MIYAUCHI	Director KDD Paris Liaison Office

## **LUXEMBOURG**

Mr. Claude LUTTY  
Conseiller de Direction Première Classe  
Ministère des Communications

## **MEXICO - MEXIQUE**

Mr. Hugo VILLANUEVA  
Conseiller  
Délégation Permanente

## **THE NETHERLANDS - PAYS-BAS**

Mr. B. RUCK  
Policy Advisor Telecommunications  
Ministry of Economic Affairs

Mr. A. BETTING  
Ministry of Transport  
and Public Works

Dr. P. de GRAAF  
Confederation of Netherlands'  
Industries and Employers VNO/NCW  
Secretary of Commission for  
Information Policy

Mr. P. WELTEVREDEN  
Director Philipps EU - Liaison Office

Mr. B. de RUITER  
Director  
Government & Intercompany Relations  
Unisource NV

## **NORWAY - NORVEGE**

Mr. Jorn RINGLUND  
Deputy Director General  
Ministry of Transport and Communication

Mr. Eivind JAHREN  
Deputy Director General  
Ministry of Government Administration

Mr. Arne GILBAKKEN  
Executive Officer  
Ministry of Industry and Energy

Mr. J. SPERSTAD  
The Norwegian Information Technology Industry  
Association

Mr. T. OLSEN  
The Research Council of Norway

Mr. T. JONVIK  
Directorate of Public Management

Prof. Jon BING  
University of Oslo  
Institute of Law and Informatics

## **PORTUGAL**

Mr. J. CASTRO CORREIA	Director Institut de l'Informatique Ministère des Finances
Mr. F. LOURENCO	Représentant de la Société Interbancaire de Services (SIBS)
Mr. F.T. GOMES	Conseiller Délégation Permanente

## **SPAIN - ESPAGNE**

Mrs. E. SALGADO	Secretary General General Secretariat of Communications Ministry of Civil Works, Transport and Environment
Mr. P. PEREZ-RIBES	Organismos Internacionales Telefónica
Mr. Luis ORTEGA	Chef de la Section Juridique Direction Générale des Télécommunications Ministère des Travaux Publics, des Transports et de l'Environnement
Mr. Manuel LAZARO	Sous-directeur général des Technologies de l'Information et des Communications Ministère de l'Industrie et de l'Energie
Mr. S. LA CASTA	Technical Advisor Directorate General for Telecommunications MOPTMA
Mr. J. L. GUZMAN MATAIX	Conseiller pour l'Industrie et l'Energie Délégation Permanente / Permanent Delegation

## **SWEDEN - SUEDE**

Mr. Jerker TORNGREN	Head of International Affairs National Post and Telecom Agency
Mr. Stefan CAIREN	Head of Section Ministry of Industry and Commerce
Mr. Göran AXELSSON	Special Advisor Ministry of Finance

Mrs. Eva MITTERMAIER

Secretary  
National IT - Commission

**SWEDEN - SUEDE** (continued/suite)

Mr. Berth EKLUNDH

Director Corporate Business Development  
LM ERICSSON

**SWITZERLAND - SUISSE**

Mr. F. RIEHL

Vice-Directeur  
Office fédéral de la Communication  
Département Fédéral des Transports,  
des Communications et de l'Energie

Mr. P. FISCHER

Deputy Director  
Federal Office for Communications

Mr. M. PACHE

Chef du Service International des Médias  
Direction Politique  
Département Fédéral des Affaires Etrangères

Mr. C. MASSET

Questions industrielles internationales  
Office fédéral des affaires économiques extérieures  
Département fédéral de l'économie publique

Mr. A. GILLABERT

Swiss Telecom PTT  
Telecom International  
International Relations

Mr. R. FORCLAZ

Adjoint Scientifique  
Office Fédéral de l'Education et de la Science  
Département Fédéral de l'Intérieur

**TURKEY - TURQUIE**

Mr. M. BÜYÜKDAVRAS

Head  
Department of Communications  
Ministry of Foreign Affairs

Mr. A.N. KORU

Chief of Section  
Ministry of Foreign Affairs

Mr. Y. CEYHUN

Advisor  
TUBITAK

Mr. M. N. AGAN

Prime Ministry  
Under Secretariat of Treasury



International Communications and Information Policy  
Bureau of Economic and Business Affairs  
US Department of State

**UNITED STATES - ETATS-UNIS** (continued/suite)

Mrs H.A. SHAW	Director Division of International Telecommunications Policy Office of International Affairs U.S. Department of Commerce
Mr. K. E. MURRAY	Attorney Advisor International Bureau Federal Communications Commission
Mr. K. LINDHORST	International Vice-President AT&T
Mrs E. BURTON	Executive Director Federal Relations US West Inc.
Mr. F. T. ELLIOTT	Office of Service Industries International Trade Administration US Department of Commerce
Mr F. W. MAERKLE	Economics Bureau U.S. Department of Commerce
Ms K. C. SANDERS	Regional Director Nynex Inc.
Mrs R. LAYTON	Counsellor Permanent Delegation / Délégation Permanente
<b>CE - EC</b>	
Mr. Carlo TROJAN	Deputy Secretary-General
Mr. Eugenio TRIANA	Advisor Hors Class DG XIII
Mr. Alain DUMORT	Principal Administrator Economic and Strategic Affairs DG XIII
Mr. Angelo REATI	Principal Administrator
Mr. G. DELL'OSSO	Principal Administrator DG III - Industry

Mr. Olivier ONIDI

General Secretariat

Ms. M. GEORGES

Expert  
DG XV

## **OBSERVERS - OBSERVATEURS**

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Ministry of Transport, Communication and Water  
Management

Mr. L. BALOGH Minister Plenipotentiary  
Embassy of Hungary

Mr. E. SCHUCHTAR Consultant  
Embassy of Hungary

### **KOREA - COREE**

Mr. M-S. KANG Senior Deputy Director  
International Policy Division  
International Cooperation Bureau  
Ministry of Information and Communication

Mr. I. CHUNG Research Fellow  
Korea Information Society Development Institute (KISDI)

Mr. C. RYU Research Fellow  
Korea Information Society Development Institute (KISDI)

### **CZECH REPUBLIC - REPUBLIQUE TCHEQUE**

Mr. KURKA Director  
State Administration and Inspection

### **BIAC**

Mr. E. WEISS Vice Chairman  
Europe  
International Telecommunications Users Group

Mr. J. H. GUETTLER Chairman EU Affairs  
International Chamber of Commerce

Ms F. CHASLES F.C. Consultants  
CNPf

Ms. Y. KURISAKI SITA  
International Relations

Mr Y. LE ROUX Digital Equipment

Mr. G. TAYLOR AT&T

**BIAC** (continued/suite)

Mr. K. LEESON

IBM Global Network

**TUAC**

Mr. R. DARLINGTON

Head of Research  
Communication Workers Union

Mr. A. BOTSCH

Assistant to the Secretary-General

**ITU**

Mr. A. BOUSSAID

Adviser  
Policy and Regulatory Affairs

**ISO**

Mr. Alain DURAND

Directeur général adjoint  
Association française de normalisation

**RAPPORTEUR**

Professor Jens ARNBAK

Professor and Chair ICT  
School of System Engineering & Policy Analysis  
Delft University of Technology

Ms. Jolien UBACHT

Research Fellow  
School of Systems Engineering & Policy Analysis  
Delft University of Technology

## OECD SECRETARIAT

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Mr. N. TANAKA Director

Mr. M. OBORNE Deputy Director

Mr. G. DRILHON Head of the Committee Secretariat Unit

### *Science, Technology, Communications Policy Division*

Mr. J. DRYDEN Head of Division

Mr. D. YPSILANTI Principal Administrator

Mrs. D. HURLEY Administrator

Mr. S. PALTRIDGE Administrator

Mr. J. BEALE Consultant

Mr. Y. KATO Consultant

Mrs Y. WALHOF Consultant